

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

An Objective Measurement of Motivation

by

Ronald B. Pickett

Thesis Advisor:

William H. Githens

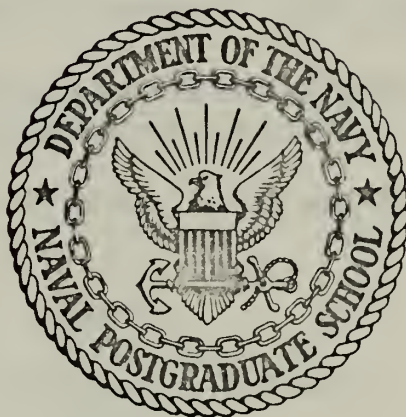
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An Objective Measurement of Motivation

by

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Commander, United States Navy
B.S., Naval Postgraduate School, 1970

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requirements for the degree of

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from the

NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This report describes a project which developed an objective measurement of motivation using Flanagan's critical incident technique. The sample population was U. S. Navy Jezebel operators. The report includes a rating form which was used, the statistical computations of the data recorded and a new, modified form. The rating form was found to have a high interrater reliability; many of the scores on the items had an exceptionally high correlation with the total score received and the study generated a particularly good operational definition of motivation.

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I. INTRODUCTION

The problem of increasing productivity or improving performance is one which concerns everyone in a managerial position. Numerous studies have been conducted to identify and attempt to control as many of the factors that have a bearing on output as possible. One of the best descriptions of the interrelated nature of the many elements involved can be found in Sutermeister (Sutermeister, 1969). In his conceptual scheme the factors most closely related and directly influential on productivity are the physical elements of the job (i.e., technological development, raw materials, job layout and methods) and the employee's job performance which he attributes to a complex interaction of ability and motivation. While ability is not a precisely defined or completely understood concept it is measurable and reliably modifiable. The motivational level of employees is a different matter altogether, both in terms of the degree of agreement on the elements of motivation and in the untapped potential for greater understanding and selective modification of motivation. It can safely be said that there is virtually universal acceptance of the important influence that motivation has in a broad range of human endeavor.

In the past 25 years there has been a proliferation of theories of motivation. Many of these, such as Maslow's "Need Hierarchy Theory," (Maslow, 1943), "McGregor's Theory Y" (McGregor, 1960), Victor Vroom's "Instrumentality Theory" (Vroom, 1964) and Herzberg's

"Two Factor Theory" (Herzberg, 1959) have generated widespread interest. More recently several organizations have come into existence that purport to selectively modify the level of motivation of individuals, groups, or of entire organizations (for example, Success Motivation Institute of Waco, Texas).

There is one fundamental element that seems to be missing in both the theoretical and the applied approaches to motivation. This missing element is a method of determining the level of motivation (as represented in performance) of a group or an individual. Such a technique is necessary to enable investigators to detect differences or changes in motivation and to test the effects of incentives or of management policy. An intensive search of the available literature failed to locate an objective instrument for the measurement of motivation.

It was important in the initial stages of this project to limit the area to be investigated and to select a definition of motivation upon which to base the study. It was assumed that motivation requires force and direction and the study was limited to the work context. Motivation then is task related effort expended in directed activity. In the investigation of the literature it became increasingly obvious that there are two quite distinct approaches to motivation, one is the classical psychological view of motivation (which refers to the processes governing choices made among alternative forms of voluntary activity), the other is motivation as seen by the management theorists. This dichotomy seems to have developed from the method of approaching the problem. The psychologists have looked at physiological states, generally resulting

from deprivation, and have inferred motivation from observed behavior, content analysis, or stated attitudes whereas researchers dealing with an industrial or social organization have tended to view motivation as the element of performance that can not be explained by any other known variable. This investigation was oriented along the latter lines, that is the scope was limited to the world of work and the motivation to perform a particular task or group of tasks.

II. NATURE OF THE PROBLEM

In the development of a measurement of motivation, the major problem was to determine what behavior is characteristic of a highly motivated task-oriented worker. Specifically it was necessary to determine whether most motivated men in a reasonably limited job category can be expected to be identifiable through a few acts or a few classes of characteristic action and whether certain actions are characteristic of all or at least a significant percentage of highly motivated people doing approximately the same job. The second important consideration was to insure that a reasonably accurate performance measure was available for the population sampled. Failure to consider this element would result in an instrument which could not be "calibrated" or tested in a real world setting. As a larger percentage of jobs have a less direct influence on production, this requirement becomes much more difficult to satisfy. Because of this, it was necessary to conduct the study outside the setting of the production line to insure relevance to modern industry and the Armed Forces.

Whenever a measurement instrument purports to measure a concept as ill-defined, poorly understood and with the many dimensions of motivation, the problems of validity and objectivity become quite severe. Is it really motivation that we are measuring or some complex and obscure artifact? Do the raters see the behavior of the people they are rating as demonstrative of an element of a

complex characteristic? How competent are raters at generalization from one specific act to a global evaluation? How much is the evaluation of motivation influenced by performance? Indeed, how much can performance and motivation be separated?

As a result of these questions it was imperative to select an experimental technique to minimize the influence of unwanted variables. A unique opportunity and certain necessary encouragement to study this problem were presented by Dr. John P. Smith of the United States Naval Personnel and Training Research Laboratory, San Diego, California. He and his Jezebel Study Group had developed an effective performance measure for operator proficiency and had done some work with a preliminary motivation rating scheme. As a part of the field testing of their proficiency test a set of general demographic information was gathered about each man. This included both biographical and experience data. As an element of this information, supervisors were asked to rate the men working for them on their degree of motivation. The instructions for this rating included the comment that "motivation implies consistent willingness to give effort to a task or duty even in the absence of demand by a military superior; it implies a belief in the importance of the Air ASW mission and it implies a constructive attitude toward other squadron personnel." The men were given a numerical rating from one to seven, this score was used for analysis and tests of correlation with the performance rating and the other factors. Their analysis revealed that two of the factors (rank and motivation) had a significantly higher

correlation with the performance rating than did the other elements and this contribution was not predicted by any of the aptitude or other personal characteristics such as GCT, ARI, age or education.

The following paragraph is an excerpt from their report:

The guidelines given to the raters to define motivation are consistent with characteristics which would be expected to be present in career personnel; if so, rank and motivation rating should be correlated. Investigation of this point resulted in a moderately low Pearsonian correlation coefficient of .36. The two variables are related, but they are also sufficiently independent of each other to strongly suggest that further study of this approach to motivation may be profitable. Further data analysis has been carried on to evaluate more precisely the significance of the motivation ratings using analysis of covariance and multiple correlation.

(Naval Personnel and Training Research Laboratory Technical Bulletin STB 11-5.)



III. EXPERIMENTAL PROCEDURE

A. GENERAL PROCEDURE

In the previous section a number of the problems inherent in developing an instrument for the measurement of motivation were discussed. A constant concern in the selection of an appropriate procedure and in processing the data that were generated was to minimize the influence of these problems. In keeping with this philosophy, the method of choice was John C. Flannigan's Critical Incident Technique. Very briefly the Critical Incident Technique involves describing a situation for the person being interviewed and asking him to relate an incident that fits this situation. Specifically, in this project the men were asked to, "Think of the most highly motivated Jezebel operator that you know. What is it about him that caused you to select him? Please be as specific as you can." After asking this question the only additional comments that were made by the interviewer were requests for greater amplification of the incidents that were reported or for more specific incidents (Flannigan, 1954).

Interviews were conducted on two occasions. The first set of interviews were with one senior petty officer from each of four VP (Patrol) squadrons and two petty officers from another squadron. Since this set represented a horizontal section across the rank structure the second interviews involved a vertical section of eight operators whose paygrade varied from E3 to E6 (AWAN-AW1) in

a single squadron. It was felt that this procedure would tend to minimize the possibility that a significant difference existed between the conception of motivated behavior held by junior and senior petty officers. The initial intent was to investigate the possibility of developing incidents descriptive of highly motivated and poorly motivated behavior. This was unsuccessful with the interview technique that was used; only positively motivated behavior was described by specific incidents. There are several possible reasons for this and they are described in the Results and Discussion Section.

A total of 97 incidents were collected and after closely related items were combined or eliminated 55 separate items were retained for use. Several independent attempts were made to order these items into dimensions of motivation and to produce a scale of increasingly favorable or graded desirability. These attempts were unsuccessful; the incidents did not naturally fall into distinct categories and they did not have varying degrees of desirability. Twenty items were selected for inclusion on the rating form. The basis for selection was the frequency that a behavior was reported or the particularly characteristic nature of the behavior. It is important to note that in several interviews one incident was sufficient to cause a man to be singled out and described. In general the behavior that was described in this manner represented a considerable amount of time and effort on a project or a breakthrough that was achieved through intense interest

and attention to the airborne ASW problem. An example of the Motivation Rating Form is included as Appendix A.

In March 1971, the form was tested at Naval Air Station, Moffett Field. The squadron (VP-19) had 18 Jezebel operators in the AW division and five senior petty officers familiar with each of the operators who were available to rate the men. The raters were asked to indicate when they were basing their evaluations on observation or an expectation. This was to attempt to separate actually observed behavior from an estimation that the man would reasonably be expected to perform in the described manner in an appropriate situation. After completing the form, each rater was asked to comment on his general attitude about the form, its acceptability, completeness and any specific comments about the description of motivation that it provided. Information from these interviews is the basis of part of the Analysis of Data section. Following the interview each rater was asked to rank order each of the men according to their mission-oriented motivation. They were asked to minimize the influence of the form they had just completed and to the best of their ability eliminate the influence of on the job performance. The information that was collected was analyzed using several statistical techniques that are described in the following section.

B. SAMPLE POPULATION

The population that was sampled in this project was drawn from United States Navy Jezebel Operators. Jezebel is a system for the

airborne classification and localization of submarines using information transmitted from sonobuoys. Specific details about the system and the techniques of analysis are classified, however, they involve a combination of training, experience, memory, mechanical and electronic devices and onboard reference publications.

The minimum requirements to become an Antisubmarine Warfare Operator (AW), the rating which includes Jezebel operators, are a minimum General Classification Test (GCT) and arithmetic test (ARI) combination of 110, successful completion of an aviation physical examination and the applicant must volunteer for AW training (approximately 7% of the applicants are selected for training). There are less than 2,100 AWs on active duty in the Navy and of these about half are designated Jezebel Operators.¹ The training that leads to assignment to a flight crew in a squadron takes nearly nine months and is in the top 25% of Navy schools on the basis of the cost of training. After assignment to a squadron, training continues until designation as a member of an Alfa Crew which indicates achievement of a high level of operational readiness and completion of a squadron training syllabus. Acquisition of basic skills, maintenance of skill, and operational flying are a full time task. Because of this AWs are becoming more and more an autonomous group, freed from

¹This information was made available by the Bureau of Personnel rating detailer.

most other duties except watch standing and certain military obligations. They are not trained in a secondary technical specialty.

IV. PRESENTATION OF DATA

In the instructions for the raters they were asked to circle the number that best fit the man's behavior in the area described by the item. They were further instructed to complete one item for all men, then to proceed to the next item and to complete it for all of the men.

In preparing the data for analysis the score on the items was totaled to give an overall grade. In some of the analyses the total score was used and in other sections the score on a particular item or an average score was used. Averaging scores was possible since each man was rated by five independent raters.

The scores that were recorded are included in the data section.

A. INTERRATER RELIABILITY (IRR)

The first analysis was a test for the interrater reliability of the form using the Pearson Product-Moment Correlation:

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

where:

r is the correlation

X is the value of one variable

Y is the value of the other variable

N is the number of cases

The results of this analysis are listed in Table I. The data from which the correlations were computed are included as Appendix C.

The statistical significance was computed for each correlation using the "Student's t":

$$t = r \frac{(n-2)}{(1-r^2)}$$

where:

r is the correlation.

n is the number of cases.

The second statistical test was a comparison of the interrater reliability based on the rank ordering that the raters were asked to do after completing the form and the rank ordering generated from the scores taken from the rating forms. For this comparison the Spearman Rank Order Correlation rho (ρ) was computed. Both sets of correlations are included in Table II for ease of comparison. The formula for computing the Spearman rho is:

$$\rho = 1 - \frac{6\sum D^2}{N(N^2 - 1)}$$

where:

D is the difference in rank ordering for the two criteria being compared.

N is the number of elements that have been ordered.

TABLE I

Interrater Reliability

Correlation ^a (between raters)	n ^b
$r_{1,2} = .639^*$	13
$r_{1,3} = .545^*$	13
$r_{1,4} = .074$	13
$r_{1,5} = .617^*$	14
$r_{2,3} = .824^{**}$	13
$r_{2,4} = .386$	13
$r_{2,5} = .931^{**}$	14
$r_{3,4} = .544^*$	13
$r_{3,5} = .916^{**}$	14
$r_{4,5} = .485^*$	14

Note.--

^aThe subscript indicates the specific rater involved, i.e., $r_{1,2}$ is the correlation between the ratings of rater 1 and rater 2.

^b $n = 14$ whenever rater 5 is involved because he was the division CPO, familiar with each of the Jezebel Operators but not qualified himself and, as such, not included in the sample. In all other cases the two raters being compared were excluded from the sample.

*Significant at the .05 level.

**Significant at the .01 level.

TABLE II

Interrater Comparison Table

IRR (Rank Ordering)	IRR (Form)	n
$\rho_{1,2} = .639^{**}$	.761**	13
$\rho_{1,3} = .095$	.586*	13
$\rho_{1,4} = .100$	.01	13
$\rho_{1,5} = .266$	.746**	14
$\rho_{2,3} = .56^*$	.745**	13
$\rho_{2,4} = 0$	.195	13
$\rho_{2,5} = .604^*$	.852**	14
$\rho_{3,4} = .123$	.255	13
$\rho_{3,5} = .600^*$	.862**	14
$\rho_{4,5} = .139$	.313	14

*Significant at the .05 level.

**Significant at the .01 level.

As can be seen from Column 1 of Table II, there was only occasional agreement in rank ordering, however quite good agreement was achieved using the form. There was much better agreement among the raters when the form was used than when a global rank ordering was made. The reasons that the one rater, rater number four, tended to differ from the others can only be generalized from the situation and from other studies. (It is interesting to note that he was rated highly in motivation by his peers and he expressed very positive feelings about the form.) Perhaps the most likely explanation stems from the type of training that is done by the squadrons. After an operator completes the formal Navy school and is assigned to a squadron the remainder of his training is conducted by the senior operators in the squadron. When a man is assigned to a crew his sphere of contacts is reduced significantly. The result of all this (coupled with social interaction) is an unequal familiarity among the operators. Many studies have been done on the reliability of human judges. The limitations and biases are well known and include such phenomenon as "halo error," "leniency error," "similarity error," and others (see, for example, Kelly, 1967). The situation that exists in a typical squadron could easily amplify these errors and could distort or invert the relative rating given to some of the men by one of the raters. This is considered to be the most probable explanation for the one differing rater.

B. ITEM ANALYSIS

The analysis of the responses to the individual items was undertaken using four general methods. First, the means and standard deviations for all responses to each item by each rater were computed, this was then broken down into two groups; one by the military rank of the person being rated and another according to the rater. Then a correlation of the average score on an item with the man's total score was calculated. Table III contains the composite score, the breakdown by seniority and the correlation with total score. Table IV is a listing of the means for each rater.

Table III can be used to determine the items that contribute most to the total score and discriminate well among the men. If an item describes a degree of behavior that is observed or expected in all men then it should have a high mean and a low variance and will not have the ability to discriminate between men. Therefore, a mean near the midpoint is desirable as is a variance at least large enough to indicate a spread of scores. Another desirable characteristic for an item is a high correlation with total score. During the interviews conducted immediately after the forms were completed it became obvious that the importance of one dimension had been overlooked; that was the differences in behavior attributable to different levels of experience. As an example of this difference, a motivated man undergoing training as an AW might show his motivation by spending extra time in the flight simulators or trainers, whereas an operator who had achieved a high level of

TABLE III

Item Comparison Table

Item	Mean All	Var. All	Mean Senior	Var. Senior	Mean Junior	Var. Junior	Corre- lation ^a All
A	3.65	1.74	4.00	1.53	3.31	1.75	.832
B	4.19	2.10	4.97	0.92	3.41	2.09	.972
C	3.69	1.72	4.03	1.24	3.36	2.03	.737
D	4.27	2.17	5.05	0.73	3.49	2.41	.942
E	4.27	2.49	4.87	1.80	3.66	2.50	.832
F	4.29	2.13	5.00	1.10	3.59	2.10	.876
G	2.36	4.21	3.87	2.38	0.84	1.45	.920
H	4.09	2.11	4.67	1.07	3.51	2.52	.679
I	2.63	3.80	3.55	2.31	1.53	3.42	.923
J	3.29	2.50	4.17	1.79	2.38	1.64	.880
K	2.83	4.17	3.74	2.50	1.88	4.24	.869
L	2.60	3.13	2.72	3.37	2.49	2.94	.621
M	3.83	2.61	4.43	1.86	3.15	2.63	.921
N	3.99	1.99	4.50	0.94	3.46	2.55	.884
O	3.45	2.40	3.91	1.26	2.94	3.22	.780
P	4.05	2.13	4.67	1.54	3.39	1.96	.955

Note.--

^aCorrelation of the item average by all raters with total scores by all raters.

TABLE IV

Rater Comparison Table

Item		Rater					Difference Between Means (H-L)
		1	2	3	4	5	
A	Mean	3.40	4.25	3.73	3.87	3.00	1.25
	Var.	2.83	1.80	0.64	1.05	1.87	
B	Mean	4.13	4.81	3.73	4.25	4.00	1.12
	Var.	2.12	1.76	1.35	2.47	2.67	
C	Mean	4.80	3.81	3.47	3.19	3.25	1.61
	Var.	1.31	1.63	0.84	2.16	1.27	
D	Mean	5.20	4.69	4.27	3.56	3.69	1.60
	Var.	2.46	1.69	0.78	2.26	2.23	
E	Mean	4.93	4.37	5.20	2.44	4.56	2.76
	Var.	1.30	2.12	1.31	1.99	1.20	
F	Mean	3.67	4.63	5.00	3.69	4.50	1.33
	Var.	2.24	2.92	1.14	2.10	1.33	
G	Mean	2.80	2.13	2.07	2.69	2.13	0.73
	Var.	4.31	4.52	2.21	4.50	5.98	
H	Mean	4.67	4.19	3.20	3.94	4.44	1.47
	Var.	2.81	2.96	1.03	1.80	1.20	
I	Mean	4.60	2.94	2.43	1.75	1.44	3.16
	Var.	1.97	3.53	1.29	1.13	4.13	
J	Mean	2.87	4.00	3.00	3.06	3.31	1.13
	Var.	2.12	2.27	3.20	2.20	3.01	
K	Mean	5.13	2.19	2.67	2.56	1.63	3.50
	Var.	1.55	1.63	----	2.86	3.98	
L	Mean	3.80	3.69	2.47	3.06	0.06	3.74
	Var.	2.89	1.56	1.27	0.73	0.06	

(Table continued on next page)

TABLE IV (continued)

Item		Rater					Difference Between Means (H-L)
		1	2	3	4	5	
M	Mean	3.60	4.06	3.71	3.75	3.94	0.46
	Var.	3.11	3.53	1.24	3.00	1.93	
N	Mean	4.67	4.13	3.75	3.81	3.50	1.17
	Var.	1.67	2.92	0.50	2.70	1.07	
O	Mean	4.8	3.06	3.75	3.69	2.25	2.55
	Var.	1.46	1.26	0.92	2.76	1.40	
P	Mean	4.46	4.63	4.42	3.56	3.31	1.37
	Var.	1.98	1.58	0.81	2.40	2.65	
Avg. Mean		4.22	3.85	3.32	3.30	3.06	

competence would be unlikely to request any more trainer periods than the minimum monthly requirement. As a correlate, a motivated and experienced man might demonstrate his motivation by working to qualify in other crew positions, an activity that would not be expected of a junior man working toward his initial qualification. This differentiation by experience level existed in some areas, however it was not a characteristic of all items, many of the items were equally applicable to junior and experienced men.

The method used to evaluate items for their applicability to a particular experience group was to use the difference in the means of the two groups to identify items with a likelihood of having this characteristic. An item with a relatively high difference should favor the experienced group and a low difference should indicate an item of greater applicability to the lower experience level. (In no case was the mean of the senior operators lower than the mean of the junior operators. The average difference in the mean was 1.4 so that smaller differences tend to identify items more characteristic of junior men.)

Another characteristic of a desirable item is that it should be marked in a similar range by all raters when rating the same group. Table IV shows the mean score on each item by each rater and the difference between the high and low score. A large difference tends to identify items that have been interpreted differently by different raters. An exception to this logic occurs when one rater has a mean which is much different from the others since either a high or low mean acts to limit the possible scores in one tail while increasing the possible scores in the other tail. In this case a slight change in the wording may greatly improve the suitability of the item. One rater, the rater whose interrater reliability was low, tended to differ markedly from the others at least twice as often as did any other rater.

To illustrate how some of these desirable characteristics have been applied to the items, compare the figures in the last column of Table IV.



Three of the items have differences between means greater than 3.00 (items I, K, and L). On examination of these items it seems logical to assume that the interpretation could be different for the different raters. Probably item I is the item most susceptible to "extension into the future." That is, evaluating the phrase in the instructions, "if the circumstances were appropriate," to include situations considerably beyond that which was expected or interpreted by most raters.

The wording of item K is such that it does not adequately describe or differentiate a highly motivated man. As it is written it could be broadly interpreted to include the majority of sailors and this apparently was the interpretation made by some of the raters. Item L was very much subject to the experience element described earlier. Limiting this item to evaluation for a particular experience group should ease the problem of interpretation.

From this analysis a new rating form was developed and is included as Appendix B. This form should have greater interrater reliability, better discrimination between highly motivated junior men and the senior men whose motivation is marginal and it should be even more acceptable to the users. In preparing this form, items with a narrow variance or a very high or low mean were either modified or eliminated and the information from Table IV, together with a "face" determination was used to separate items by their applicability to a particular experience group.

C. POLICY CAPTURING

Certain exploratory attempts were made to understand the criteria the raters used in the free rank-ordering. These efforts at policy capturing were rudimentary and not originally planned for inclusion in this study. The working concept was that in general raters tend to make evaluations based on a limited number of elements even if much more data is available (Whisler & Harper, 1962). Because of this it seemed possible that the rank-ordering was made on the basis of only a few types of behavior and, if this was the case, they should be among the incidents described in the items on the form. To test for any primary relationship a scatter plot was drawn for each item showing the average score that the man was given by the five raters on the item, plotted against his average rank order. This was largely unsuccessful, although two items (O and B) did have a plot somewhat similar to the expected shape. If a strong correlation had been found, it might have pointed to a simplification of the rating technique or of the definition of motivation.

This analysis was undertaken to determine if further, more exhaustive techniques such as factor analysis were warranted. Because of the weak correlation and the limited data no further investigation was undertaken at this time.

D. PROBLEMS AND UNANSWERED QUESTIONS

In the conduct of the project several problems came up which deserve discussion. First was the question of the character of motivation in the population sampled. Does the full spectrum exist from highly

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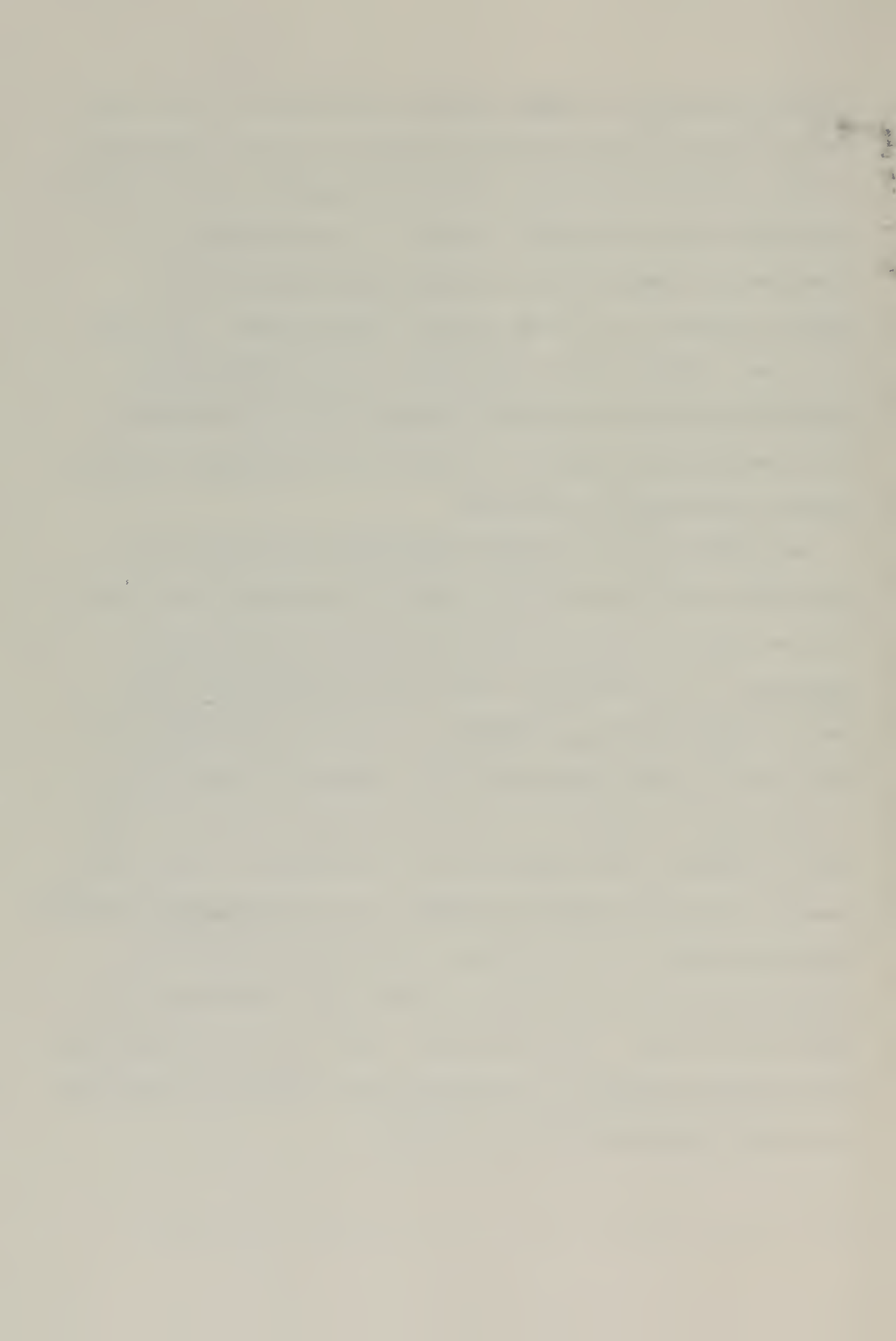
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D. PROBLEMS AND UNANSWERED QUESTIONS

In the conduct of the project several problems came up which deserve discussion. First was the question of the character of motivation in the population sampled. Does the full spectrum exist from highly

favorable motivation to strongly negative motivation, or is the range limited (because of the selection procedures) to the area from neutral to highly favorable motivation? During the interviews it was impossible to generate neutral or negative incidents. It is difficult to conceptualize examples of low or negative motivation other than apathy, disinterest, or, in the extreme, destructiveness. This may be, in part, related to the questioning or interviewing technique used where positive or favorable situations were set up initially. If the procedure were reversed it is possible that neutral or negative incidents could have been developed.

One problem that is frequently perplexing in the analysis of evaluations is the so-called "halo effect," the propensity for raters who know a man who should be rated high in one area (for example, promptness) to rate him high in other areas for which they do not have an adequate basis for evaluation. It can be expected that this would occur on a motivation evaluation. However, what may appear to be "halo error" is expected if each item is really measuring the same thing. Secondly, such an error may not be detrimental to the ultimate result in the early stages of development if certain necessary behavioral descriptions have not been included. This possibility should be alleviated when and if motivation is broken down to dimensions which can be put on scales. While motivation is very likely multidimensional the detailed investigation of these dimensions might best proceed from an initially global definition or treatment.



A clear and present problem in the measurement of any complex characteristic is the validity of the method chosen. This problem is a continuing one and one which can only be decreased with extensive and lengthy techniques. Further, it is intensified in the early stages of test development. There are at least two types of validity which the Critical Incident Techniques insure. First is what might be termed source validity; it is a valid measure of motivation because it was developed from descriptions of motivated behavior. To a degree this same fact can be considered to imply consensual validity and the consensus was further guaranteed by the post-test interviews. Face validity is at best an insufficient test, however, the form as administered certainly does have face validity.

To improve the validity, to generate a numerical value for the validity of this instrument for measuring motivation will pose certain problems. First and most imposing is the problem that arises from the fact that this investigation was at the limit of current understanding of motivation. Because of this there are no other equal or similar intermediate criterion against which this can be compared. However, certain schemes can be envisioned which might involve setting some situation or series of situations in which a motivated man might be expected to perform in a particular fashion. These concepts are only fragmentary and conjectural and would require a great deal of additional thought and testing before they could be attempted.

V. CONCLUSIONS AND RECOMMENDATIONS

The most significant conclusion that can be drawn from this study is that an instrument was developed that improved the reliability of ratings of a person's motivation. Since this work was in an area that has been virtually untouched, it was impossible to relate the results to any other findings for comparison.

A second conclusion that seems to be warranted is that such an instrument would be applicable across a wide range of different skills and tasks with only minor modification. This conclusion was supported by the very general nature of the items that were generated in the interviews even though special attention was given to elicit and report incidents with the highest possible degree of specificity. This characteristic, while not completely unexpected, was encountered to a surprising extent. It is considered that a very few different forms could be developed to cover all but the most extraordinary of occupations or individuals. This conclusion will require additional study to verify.

It is certainly not expected that a strong relationship exists between task or job motivation and career motivation. However, it does seem likely that a low task motivation should help to identify people who would be less desirable to retain in the military.

There is a need to look at the variation of motivation over time and to test this variation with performance. The time dimension is one which has not been investigated.

The low relationship between morale or job satisfaction and production is well known, however, it seems possible that there may be a more complex interrelation with motivation being a key element. This possibility can be investigated through a motivation form.

One of the most intriguing possibilities is the use of these findings and the methods that were used to discover and to appropriately value incentives. The relationship between the behavior that was reported as demonstrative of motivation and incentives that might be useful in motivating workers may at first seem remote. However, many times during the interviews the situation was an important element in the display of motivated behavior. It was often the case that the situation seemed to be the motivating factor and as such should be viewed as an important incentive. These descriptions were strongly supportive of Herzberg's "Two Factor Theory," the most profound motivation came as a direct result of doing the job the men are trained to do. During the interviews it became obvious that problems in communicating ideas and value systems from the lowest levels in an organization to levels where meaningful action can be taken are still very much the rule. Attempts at uncovering valued incentives should help to bridge this gap.

Most personnel evaluation systems require a rating of personal attributes or personality variables and the value of these variables to an organization is highly subjective at best. Personality traits are extensively used in evaluating the performance of people who are far removed from a direct influence on production. It may well be that

motivation is a trait that is meaningful to an organization and can be measured more precisely, reliably and more objectively than many of the traits currently being rated. There is the added possibility that it will have greater correlation with relevant performance than the other traits.

The development of a well tested, reliable and accurate measurement technique for motivation and one that is relatively free from the effects of performance would provide a powerful new tool for further investigation of numerous concepts of management policy and leadership techniques. It is possible that changes in motivation might be a much more valid measure of leadership and management ability than output or performance in fields where ultimate criteria can only be inferred or that are strongly influenced by equipment differences or situational aspects which are not easily assessed.

Certainly this project has done one thing and that is to generate an objective operational definition of task-oriented motivation.

APPENDIX A

MOTIVATION

Background Information: This evaluation form is an attempt to develop an objective measure of motivation. The items that are included have been taken from descriptions of highly motivated men.

Directions: Circle the number that best indicates how characteristic the item is of the man being rated. The evaluation should be based upon direct observation wherever possible. When direct observation has not occurred, indicate whether you think the man would act in the manner described if the circumstances were appropriate. This evaluation is directed at mission or job-oriented motivation only.

<u>Item</u>	<u>Frequently</u>			<u>Occasionally</u>			<u>Never</u>
	6	5	4	3	2	1	0
A. Asks probing important questions; questions that are difficult to answer and often require special effort or research.	6	5	4	3	2	1	0
B. Doesn't wait to be told to do something, sees things that need to be done and does them.	6	5	4	3	2	1	0
C. Seeks out other operators that you consider to be motivated, enjoys being around professionally competent men. Avoids poorly motivated men.	6	5	4	3	2	1	0
D. Has taken time out to help someone with a problem.	6	5	4	3	2	1	0
E. Discusses advancement and proficiency exams with other operators at length shortly after taking them.	6	5	4	3	2	1	0
F. Watches and assists mechanics or technicians in the repair of equipment to help them and to improve his own knowledge.	6	5	4	3	2	1	0

<u>Item</u>	<u>Frequently</u>			<u>Occasionally</u>			<u>Never</u>
	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
G. Has given lectures and has prepared lesson plans when he was not required to do so.	6	5	4	3	2	1	0
H. Has gone to extra effort to get information or to prepare himself ahead of time to help make a flight go smoothly.	6	5	4	3	2	1	0
I. Has originated improvements in equipment or procedures.	6	5	4	3	2	1	0
J. Has shown interest in the other crew positions in the aircraft and has taken positive steps to qualify in one or more of them.	6	5	4	3	2	1	0
K. Has come back to the squadron from TAD or even from leave to attend an important lecture or to complete an important task.	6	5	4	3	2	1	0
L. Spends more than the minimum time in the trainers. Asks for additional trainer periods.	6	5	4	3	2	1	0
M. Has contacted other squadrons, the Wing, the ASCAC or FAETUPAC to get any new or relevant information.	6	5	4	3	2	1	0
N. Was reluctant or hesitant to leave an important or interesting situation directly related to the ASW mission.	6	5	4	3	2	1	0
O. Starts the preflight checks of equipment prior to the normal time in order that any problems encountered can be corrected.	6	5	4	3	2	1	0
P. Has stayed on a job until it was finished regardless of regular working hours.	6	5	4	3	2	1	0

The following items can be answered by either Yes or No.

Item

Q. Has learned a special procedure on his own from manuals and publications and is considered to be an expert in this area by the personnel in the squadron and, perhaps in other squadrons as well.	Yes	No
R. Is interested in making sure that important intelligence information is sent to higher levels in the information chain.	Yes	No
S. Has an eagerness to find and share new information with other squadron personnel.	Yes	No
T. Assumes that the information that is being developed on a mission is important and will be used later on by someone who wasn't there when it was collected; keeps his logs and grams accordingly.	Yes	No

Name of man being rated _____

Rater's initials _____



APPENDIX B

MOTIVATION (REVISED)

Background Information: This evaluation form is an attempt to develop an objective measure of motivation. The items that are included have been taken from descriptions of highly motivated men.

Directions: Circle the number that best indicates how characteristic the item is of the man being rated. The evaluation should be based upon direct observation wherever possible. When direct observation has not occurred, indicate whether you think the man would act in the manner described if the circumstances were appropriate.

The first five items (A-E) should be completed for junior men only. Junior in this case should be considered as not having achieved Alfa-Crew status.

<u>Item</u>	<u>Increasingly Favorable</u> →						
	0	1	2	3	4	5	6
A. Asks probing, important questions; questions that are difficult to answer and often require special effort or research.	0	1	2	3	4	5	6
B. Spends more than the minimum time in the trainers. Asks for additional trainer periods.	0	1	2	3	4	5	6
C. Seeks out other operators that you consider to be motivated, enjoys being around professionally competent men.	0	1	2	3	4	5	6
D. Starts the preflight checks of equipment prior to the normal time in order that any problems encountered can be corrected.	0	1	2	3	4	5	6
E. Has gone to extra effort to get information or to prepare himself ahead of time to help make a flight go smoothly.	0	1	2	3	4	5	6

The second five items (F-J) should be completed for senior operators.

Item	Increasingly Favorable →						
	0	1	2	3	4	5	6
F. Has given lectures and has prepared lesson plans when he was not required to do so.	0	1	2	3	4	5	6
G. Has come back to the squadron from TAD or even from leave to attend an important task.	0	1	2	3	4	5	6
H. Has originated improvements in equipment or procedures.	0	1	2	3	4	5	6
I. Has shown interest in the other crew positions in the aircraft and has taken positive steps to qualify in one or more of them.	0	1	2	3	4	5	6
J. Has taken time out to help someone with a problem.	0	1	2	3	4	5	6

The remaining items should be completed for all operators.

K. Has contacted other squadrons, the Wing, the ASCAC or FAETUPAC to get any new or relevant information.	0	1	2	3	4	5	6
L. Was reluctant or hesitant to leave an important or interesting situation directly related to the ASW mission.	0	1	2	3	4	5	6
M. Discusses advancement and proficiency exams with other operators at length shortly after taking them.	0	1	2	3	4	5	6
N. Has stayed on a job until it was finished regardless of regular working hours.	0	1	2	3	4	5	6
O. Watches and assists mechanics or technicians in the repair of equipment to help them and to improve his own knowledge.	0	1	2	3	4	5	6

Item

Increasingly Favorable →

0 1 2 3 4 5 6

P. Doesn't wait to be told to do something, sees things that need to be done and does them.

0 1 2 3 4 5 6

Q. Is interested in making sure that important intelligence information is sent to higher levels in the information chain.

0 1 2 3 4 5 6

R. Has an eagerness to find and share new information with other squadron personnel.

0 1 2 3 4 5 6

S. Assumes that the information that is being developed on a mission is important and will be used later on by someone who wasn't there when it was collected; keeps his logs and grams accordingly.

0 1 2 3 4 5 6

Name of man being rated _____

Rater's initials _____

APPENDIX C

DATA SECTION 1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
3	6	4	6	5	6	6	6	2	6	1	0	4	5	3	6	6 B ₁ L
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6 B
5	6	4	6	5	6	3	5	3	6	3	4	6	5	4	6	6 W
3	4	5	6	5	4	3	5	4	4	5	3	2	3	4	5	6 J
5	6	5	4	3	3	3	5	3	2	3	4	6	5	3	4	6 G
1	3	3	2	4	4	0	4	0	1	0	0	4	3	1	2	4 B ₂ L
3	3	3	4	4	5	1	3	-	2	0	2	2	3	-	-	4 B
3	4	3	3	4	4	0	4	1	3	2	3	4	3	2	3	4 W
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4 J
4	3	3	3	2	4	1	4	2	2	2	3	4	2	4	3	4 G
4	4	5	3	5	3	0	5	0	3	0	0	4	3	3	3	4 C ₁ L
3	2	3	3	4	3	0	1	-	-	-	2	-	-	-	-	4 B
2	2	2	2	2	1	0	0	0	0	0	1	0	0	0	2	4 W
0	1	2	0	5	0	0	0	0	0	3	2	0	3	3	3	4 J
2	1	0	1	0	1	0	1	0	1	0	2	0	2	0	1	4 G

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DATA SECTION 1 (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
5	6	4	5	6.	4	4	5	1	4	5	0	5	5	3	6	7 C ₂ L
4	5	4	5	6	5	3	4	-	-	5	2	5	-	-	5	7 B
4	5	6	5	6	6	5	4	5	5	3	4	5	5	4	5	7 W
2	6	6	5	5	5	4	5	5	2	6	5	5.	5	6	4	7 J
5	5	4	6	4	4	5	4	2	3	5	3	4	5	5	4	7 G
4	5	5	4	5	4	0	5	0	3	1	0	4	3	2	4	3 C ₃ L
4	3	2	4	5	5	1	3	-	-	-	4	3	4	3	4	3 B
4	4	4	4	4	4	0	3	1	2	2	3	4	4	2	4	3 W
5	4	5	6	3	3	3	4	5	3	6	5	3	5	5	5	3 J
5	4	4	4	2	4	0	4	1	5	0	3	5	5	6	5	3 G
2	4	3	3	5	6	3	5	2	5	2	0	4	4	2	4	5 F L
5	5	4	5	6	6	3	4	3	4	-	2	4	4	-	5	5 B
4	5	3	4	5	3	1	4	3	4	1	3	4	4	3	4	5 W
2	3	5	5	5	2	2	3	4	2	4	1	2	2	3	1	5 J
4	5	3	4	2	5	4	4	2	3	3	2	5	4	3	4	5 G

(continued on next page)

DATA SECTION 1 (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
2	5	4	4	5	5	2	5	2	5	1	0	4	3	3	5	6 H L
3	4	4	5	6	4	3	2	3	-	3	1	3	4	4	5	6 B
6	6	6	6	6	6	6	6	6	6	3	5	5	5	4	6	6 W
3	4	4	5	6	5	5	3	5	2	6	2	3	4	5	4	6 J
4	5	4	5	4	6	5	5	3	6	5	3	5	6	5	6	6 G
2	1	3	2	4	3	0	3	0	2	0	0	4	2	1	1	4 K ₁ L
4	4	4	5	6	6	3	4	-	3	-	3	-	4	-	4	4 B
5	6	3	4	4	6	1	6	3	5	3	4	3	5	3	5	4 W
2	4	4	4	5	2	0	5	4	2	3	3	1	4	3	3	4 J
4	6	4	2	4	5	4	4	2	3	2	3	4	4	5	4	4 G
5	3	5	3	4	4	6	4	0	1	0	0	4	4	3	3	4 K ₂ L
5	4	4	4	6	6	1	5	-	-	-	5	-	-	-	4	4 B
6	6	6	6	5	6	3	4	2	4	3	6	6	6	4	6	4 W
4	2	6	6	-	4	0	6	5	3	6	6	5	6	6	5	4 J
4	5	3	4	3	2	3	4	0	1	2	4	3	5	5	3	4 G

(continued on next page)

DATA SECTION 1 (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
2	3	2	4	4	4	4	4	0	4	1	0	4	4	2	2	5 K ₃ L
4	4	4	4	5	5	2	3	2	-	-	2	-	-	-	3	5 B
5	5	3	5	4	5	1	5	3	5	2	4	4	4	3	5	5 W
2	3	4	6	5	4	3	6	5	2	3	2	5	5	4	4	5 J
3	3	4	3	1	3	0	4	1	3	4	3	2	3	4	2	5 G
4	6	2	6	5	6	6	6	5	6	4	0	6	5	3	6	6 L L
4	5	4	5	6	6	4	3	3	5	-	2	5	3	-	6	6 B
5	6	4	6	6	6	4	6	5	4	3	5	6	5	4	6	6 W
6	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6 J
4	5	2	5	4	5	6	5	3	5	3	5	5	4	4	4	6 G
2	3	2	3	4	4	0	3	0	3	0	0	4	3	1	2	4 M L
4	4	4	4	5	5	1	3	-	-	-	4	-	3	-	4	4 B
3	4	3	4	3	4	1	4	3	4	2	3	4	3	3	4	4 W
5	5	5	6	5	3	3	6	5	3	5	3	4	6	5	5	4 J
3	4	3	3	3	3	2	3	1	3	2	3	4	4	3	4	4 G

(continued on next page)

DATA SECTION 1 (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
1	2	3	3	2	3	0	5	0	2	0	0	2	2	0	2	3 P L
2	1	1	2	2	3	0	2	-	0	-	1	-	-	-	-	3 B
3	2	3	3	1	1	0	1	0	3	0	2	0	1	2	3	3 W
4	4	4	6	6	3	3	4	5	3	6	3	4	5	4	4	3 J
2	1	0	1	0	2	0	1	1	2	0	2	0	1	0	0	3 G
3	2	2	1	3	4	0	2	0	1	0	0	4	2	2	1	4 R L
3	3	3	4	5	4	1	3	-	-	-	2	-	-	-	3	4 B
2	5	3	5	4	5	0	4	2	4	1	3	3	4	3	4	4 W
4	5	6	6	5	5	0	6	5	2	6	5	4	6	6	6	4 J
3	4	3	2	1	2	1	4	1	2	3	2	4	3	4	3	4 G
5	6	2	6	6	6	6	5	4	6	3	0	6	5	2	5	6 T L
4	5	4	5	6	6	5	4	3	-	-	2	4	5	3	5	6 B
6	6	5	6	5	6	5	6	5	5	2	4	5	6	4	5	6 W
6	6	6	6	2	5	6	6	6	5	6	6	6	6	6	6	6 J
5	5	4	5	2	5	5	6	3	5	2	4	5	5	4	5	6 G

(continued on next page)

DATA SECTION 1 (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R		
3	5	3	4	6	6	3	4	3	5	3	0	4	4	3	4	6	W	L
4	4	4	5	6	6	3	4	3	4	-	3	-	-	-	5	6		B
5	5	3	6	6	5	4	5	5	4	5	5	6	6	4	6	6		W
3	5	4	5	6	5	4	5	5	4	6	5	4	4	6	6	6		J
5	6	5	5	4	5	4	5	3	3	5	3	4	5	4	5	6		G

Note.--

1. Column R is a coding for rank; 3 is AWAN, 4 is AW3, 5 is AW2, 6 is AW1, and 7 is AWC.
2. The rows are the scores given by the rater coded in the far right column.

DATA SECTION 2

L X ₁ ^a	R ₁ ^b	RO ₁ ^c	B X ₂	R ₂	RO ₂	W X ₃	R ₃	RO ₃	J X ₄	R ₄	RO ₄	G X ₅	R ₅	RO ₅	GCT	ARI	R	
70	4	5	--	--	--	77	6	8	65	11	8	64	6	1	70	67	6	B ₁
32	13	12	35	12	12	46	14	12	--	--	--	46	12	11	58	59	4	B ₂
45	9	4	21	14	14	14	16	16	22	15	15	12	16	16	60	58	4	C ₁
73	2	6	53	5	7	77	6	9	76	5	11	68	5	6	58	57	7	C ₂
49	8	2	45	8	3	49	13	7	70	7	6	51	8.5	8	59	62	3	C ₃
54	7	9	60	2	2	55	10	11	46	14	13	57	8.5	10	64	58	5	F
55	6	11	54	4	10	88	1	1	66	10	10	77	1	4	--	--	6	H
28	14	15	50	7	4	66	8	4	49	13	14	60	7	9	65	64	4	K ₁
43	11	1	44	9	6	79	5	2	70	7	5	51	10	3	71	70	4	K ₂
44	10	8	38	11	11	63	9	10	63	12	12	43	13	12	67	69	5	K ₃
76	1	--	61	1	5	81	2	5	95	1	2	69	4	7	--	--	6	L
34	12	7	41	10	9	52	11.5	14	76	5	4	47	11	14	60	64	4	M
27	15.5	13	14	15	15	25	15	15	68	9	7	13	15	15	63	69	3	P
27	15.5	14	31	13	13	52	11.5	13	77	3	3	42	14	13	66	60	4	R
73	2	3	56	3	1	81	2	6	90	2	1	70	3	2	63	59	6	T
57	5	10	51	6	8	80	4	3	77	3	9	71	2	5	--	--	6	W

Note.--

^aTotal score given by Rater L.

^bRank-ordering from form.

^cFree rank-ordering.

DATA SECTION 3

Average Total Score	Average Score on Item							
	A	B	C	D	E	F	G	H
B 69.00	4	5.50	3.20	4.40	4.50	4.75	3.75	4.20
B ₁ 39.75	2.75	3.30	3.00	2.40	3.50	4.25	.50	3.75
B ₂ 22.80	2.20	2.00	2.40	1.80	3.20	1.60	0.00	1.40
C ₁ 69.40	4.00	5.40	4.80	5.20	5.40	5.40	4.20	4.40
C ₂ 54.00	4.40	4.00	4.00	4.40	3.80	4.00	.80	3.80
C ₃ 54.40	3.40	4.40	3.60	4.20	4.60	4.40	2.60	4.00
H 68.00	3.60	4.80	4.40	5.00	5.40	5.20	4.20	4.20
K 50.60	3.40	4.20	3.60	3.40	4.60	4.40	1.60	4.20
K ₁ 55.40	4.80	4.00	4.60	4.60	4.50	2.60	2.60	4.60
K ₂ 54.20	3.20	3.60	3.40	4.40	3.80	4.20	2.00	4.40
K ₃ 76.40	4.60	5.60	3.60	5.60	5.40	5.60	5.20	5.40
L 50.00	3.40	4.00	3.40	4.00	4.00	3.80	1.40	3.80
M 29.40	2.40	2.00	2.20	3.00	2.20	2.40	.60	2.60
P 45.80	3.00	3.80	3.40	3.60	3.60	4.00	.40	3.80
R 74.00	5.20	5.60	4.20	5.60	4.20	5.60	5.40	2.70
T 67.20	4.00	5.00	3.80	5.00	5.60	5.40	3.60	4.60

Average Total Score	Average Score on Item							
	I	J	K	L	M	N	O	P
B 69.00	3.00	4.40	3.00	2.75	4.50	4.50	3.50	5.25
B ₁ 39.75	0.75	2.00	1.00	2.00	3.50	3.75	3.75	2.67
B ₂ 22.80	0.00	1.00	0.75	1.75	1.00	2.00	1.50	2.25
C ₁ 69.40	3.25	3.75	4.80	2.80	4.80	5.00	4.50	4.80
C ₂ 54.00	1.75	3.25	2.25	3.00	3.80	4.20	3.60	4.40
C ₃ 54.40	2.80	4.00	2.50	1.60	3.40	3.60	2.75	3.60
H 68.00	3.80	3.75	3.60	2.20	4.00	4.40	4.20	5.20
K 50.60	2.25	3.00	2.00	2.60	3.00	3.80	3.00	3.40
K ₁ 55.40	1.75	2.25	3.75	4.20	4.50	5.25	4.60	4.20
K ₂ 54.20	2.20	3.25	2.50	2.20	3.75	4.00	3.25	4.20
K ₃ 76.40	4.40	5.20	4.00	3.60	5.60	4.60	4.25	5.60
L 50.00	2.25	4.25	2.25	2.60	4.00	3.80	3.00	3.80
M 29.40	1.50	2.00	1.50	1.60	1.50	2.25	1.50	2.25
P 45.80	2.00	2.25	2.50	2.40	3.75	3.75	3.75	3.40
R 74.00	4.20	5.25	3.25	3.20	5.20	5.40	3.80	5.20
T 67.20	3.80	4.00	3.75	3.20	4.50	4.75	4.25	4.20

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13. ABSTRACT

This report describes a project which developed an objective measurement of motivation using Flanagan's critical incident technique. The sample population was U. S. Navy Jezebel operators. The report includes a rating form which was used, the statistical computations of the data recorded, and a new, modified form. The rating form was found to have a high interrater reliability; many of the scores on the items had an exceptionally high correlation with the total score received and the study generated a particularly good operational definition of motivation.

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